



Standard Test Method for (Analytical Procedure for) Analyzing the Effects of Partial Penetration of Control Well and Determining the Horizontal and Vertical Hydraulic Conductivity in a Nonleaky Confined Aquifer¹

This standard is issued under the fixed designation D 5473; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers an analytical solution for determining the horizontal and vertical hydraulic conductivity of an aquifer by analysis of the response of water levels in the aquifer to the discharge from a well that partially penetrates the aquifer.

1.2 *Limitations*—The limitations of the technique for determination of the horizontal and vertical hydraulic conductivity of aquifers are primarily related to the correspondence between the field situation and the simplifying assumption of this test method.

1.3 The values stated in either inch-pound or SI units are to be regarded separately as the standard. The values given in parentheses are for information only.

1.4 *This standard does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

D 653 Terminology Relating to Soil, Rock, and Contained Fluids²

D 4050 Test Method for (Field Procedure for) Withdrawal and Injection Well Tests for Determining Hydraulic Properties of Aquifer Systems²

D 4105 Test Method for (Analytical Procedure for) Determining Transmissivity and Storativity of Nonleaky Confined Aquifers by the Modified Theis Nonequilibrium Method²

D 4750 Test Method for Determining Subsurface Liquid Levels in a Borehole or Monitoring Well (Observation Well)²

3. Terminology

3.1 Definitions:

3.1.1 *aquifer, confined*—an aquifer bounded above and below by confining beds and in which the static head is above the top of the aquifer.

3.1.2 *confining bed*—a hydrogeologic unit of less permeable material bounding one or more aquifers.

3.1.3 *control well*—well by which the head and flow in the aquifer is changed, for example, by pumping, injection, or imposing a constant change of head.

3.1.4 *drawdown*—vertical distance the static head is lowered due to the removal of water.

3.1.5 *hydraulic conductivity*—(field aquifer tests), the volume of water at the existing kinematic viscosity that will move in a unit time under a unit hydraulic gradient through a unit area measured at right angles to the direction of flow.

3.1.6 *observation well*—a well open to all or part of an aquifer.

3.1.7 *piezometer*—a device so constructed and sealed as to measure hydraulic head at a point in the subsurface.

3.1.8 *specific storage*—the volume of water released from or taken into storage per unit volume of the porous medium per unit change in head.

3.1.9 *storage coefficient*—the volume of water an aquifer releases from or takes into storage per unit surface area of the aquifer per unit change in head.

3.1.10 *transmissivity*—the volume of water at the existing kinematic viscosity that will move in a unit time under a unit hydraulic gradient through a unit width of the aquifer.

3.1.11 *unconfined aquifer*—an aquifer that has a water table.

3.1.12 For definitions of other terms used in this test method, see Terminology D 653.

3.2 Symbols: Symbols and Dimensions:

3.2.1 a [nd]— $(K_z/K_r)^{1/2}$.

3.2.2 b [L]—thickness of aquifer.

3.2.3 d [L]—distance from top of aquifer to top of screened interval of control well.

3.2.4 d' [L]—distance from top of aquifer to top of screened interval of observation well.

3.2.5 f_s [nd]—dimensionless drawdown factor.

¹ This test method is under the jurisdiction of ASTM Committee D18 on Soil and Rock and is the direct responsibility of Subcommittee D18.21 on Ground Water and Vadose Zone Investigations.

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² *Annual Book of ASTM Standards*, Vol 04.08.